

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

## PCT

### WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing *Due: 25-Dec-05*  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/L2004/000188

International filing date (day/month/year)  
25.02.2004

Priority date (day/month/year)

International Patent Classification (IPC) or both national classification and IPC  
H01L41/09

Applicant  
NANOMOTION LTD.

#### 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

#### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

#### 3. For further details, see notes to Form PCT/ISA/220.

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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ in written format
    - ☐ in computer readable form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in computer readable form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-29
	No: Claims	
Inventive step (IS)	Yes: Claims	1-29
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-29
	No: Claims	

2. Citations and explanations

**see separate sheet**

**Re Item V.**

1. Reference is made to the following documents:

- D1: WO 00/74153
- D2: JP 2000-324863
- D3: US 5 453 653
- D4: WO 2004/012279

2. Document D1, which is considered to represent the most relevant state of the art, discloses (the references in parentheses applying to this document) a method of moving a body comprising coupling one piezoelectric motor to the object to be moved and controlling the motor in such a way that oscillations in the x- and y-direction (within the plane of the object to be moved) are excited in the motor, moving the object within the plane defined by the x- and y-directions (p. 12, l. 11 - p.13, l. 32).

From this, the subject matter of independent claim 1 differs in that the method involves controlling a plurality of motors where at least one of the motors applies a force parallel to the surface of the body to be moved, and at least one other motor is controlled simultaneously in such a way that the coupling region executes vibrations that are perpendicular to the surface.

2.1. The subject matter of claim 1 is therefore novel (Article 33(2) PCT).

The problem solved in the present invention may be regarded as how to provide an improved method of moving a body in one plane with piezoelectric actuators.

2.2. The solution provided in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The method proposed in the present application allows the use of a plurality of motors, where at least one motor moves the object in their dedicated direction of movement whereas at least another motor only moves in a direction perpendicular to the coupling surface of the body to be moved in such a way that when the first motor is engaged, the

coupling region of the other motor is disengaged, thus reducing the friction to be overcome during movement.

Nowhere in the prior art it is disclosed or suggested to operate a plurality of piezoelectric motors in such a way that while at least one applies a force to the body to be moved parallel to the surface, the coupling regions of others only execute vibrations in a direction perpendicular to that surface.

**2.3.** Claims 2-15 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**2.4.** Document D2 discloses a piezoelectric actuator with two separate vibrating sections, one section vibrating in the direction parallel, and the other perpendicular to the direction of movement, the contacting end of the actuator thus performing elliptical movements which cause the body to move (abstract and fig. 1). The operating principle is thus similar to that of the actuator in D1. Documents D3 and D4 disclose similar actuators to that disclosed in D1 with corresponding operating methods. Hence the arguments regarding novelty and inventive step given above apply accordingly also for D2-D4.

**2.5.** Independent claim 16 refers to an apparatus for performing the method claimed in claim 1. Since the features of claim 16 correspond directly to the method steps as claimed in claim 1, the arguments regarding novelty and inventive step given above apply accordingly.

**2.6.** Claims 17-29 are dependent on claim 16 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**3.** Industrial applicability is given in the field of piezoelectric actuators.